APPENDIX C
RISC DEFAULT RECREATIONAL EXPOSURE

Main Plant Area (OU5) - Basis of Design Report
Continental Steel Superfund Site
Kokomo, IN
Remedial Design

WA No. 122-RDRD-05BW/Contract No. 68.-W6-0025
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Prepared for U.S. Environmental Protection Agency
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Attachment A-4
Remediation Goals Based on a Recreational Use Exposure Scenario

Continental Steel Superfund Site, Kokomo, Indiana

RISC Default Recreational Exposure
General Playground (non-specific)

It is assumed that the park is similar to a general playground area type park and not a sports complex or other specialized type park. Children residing near the park have continual access and may be exposed with a frequency and duration that is similar to a residential exposure. Recreational exposures are also primarily child only exposures. Current toxicity data bases do not provide child only slope factors and reference doses. Given these considerations the following shall be considered a default recreational exposure.

Exposure Frequency based on continual and frequent access from nearby residents:

Summer	12 weeks x 5 days/wk	=	60 days
Fall and Spring	26 weeks x 3 days/wk	=	78 days
Winter	14 weeks x 1 day/wk	=	14 days
	Total	=	**152 days**

Intake

Inhalation (inhaling m^3/day)

Dermal (absorbance through the skin using the amount of soil adhering to skin and the surface area of exposed skin)

Ingestion (ingesting mg/day of soil)

Equations:

Equations combine all three absorption routes in an additive fashion:

Noncarcinogenic-child only
Carcinogenic-child only

Equation inputs

Target Risk	1 x 10-5 (RISC, 2001)
Hazard Quotient	1 (RISC, 2001)
Exposure frequency	152 days/yr (as above)
ED child	10 yrs (based on ages 2-12 yrs)
AT carcinogen	70 x 365 days
AT noncarcinogen	ED x 365 days
Skin surface area child	4084 cm2 (EFH, 1997)
Soil to skin adherence	0.5 mg/cm^2 (RISC, 2001)
BW child	26.8 kg (EFH, 1997)
Skin absorption - organics	Compound specific (default: 0.1)
Skin absorption - inorganics	Compound specific (default: 0.01)
Inhalation rate child	10.8 m3/day (EFH, 1997)
Ingestion rate child	200 mg/day (RISC, 2001)

Skin Surface Area

This value calculated as percentage of total body surface area exposed during:

Summer = hands, feet, arms, legs, hands, and head
Spring and fall = arms, head and hands
Winter = head

Value was calculated by using table 6.8 (EFH, 1997) to total the percent exposed body surface area by age group and season, then averaging to obtain the 2-12 year average exposed body surface area for a child by season; and, weighting the exposed body surface area percent by season (taking into consideration the number of exposure days) to obtain an annual average percent exposed body surface area for children. Using Table 6.6 (EFH, 1997) the average skin surface area was determined for ages groups 2-12. This surface area was multiplied by the weighted annual average percent exposed surface area for children ages 2-12 to obtain 4084 cm^2.

Inhalation Rate

The inhalation rate was determined as an average of 3-5, 6-8, and 9-11 age groups mean inhalation rates/day from Table 5-23 (EFH, 1997).

Body Weight

This value is the average mean kg body weight of children ages 2-12 years from table 7.3 (EFH, 1997).

References

EFH, 1997: USEPA Exposure Factors Handbook Volume 1, General Factors. EPA/600/P-95/002Fa, August, 1997.

RISC, 2001: Risk Integrated System of Closure, Technical Resource Guidance Document. IDEM, Final. February 15, 2001.

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EPA-NCEA provisional value

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EPA Dermal Guideance

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EPA-NCEA provisional value = 3.1 mg/kg/day

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EPA-NCEA provisional value

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EPA Dermal Guideance

Calculation of Preliminary Cleanup Goals - Continental Steel Superfund Site, Kokomo, Indiana
Recreational Exposure Scenario
Potential Exposure to Chemicals in Surface and Shallow Soils

EXPOSURE PARAMETERS	UNITS	VALUE
Target cancer risk	TR	1E-05
Target Hazard Quotient	THQ	1.0
Body weight, adult (kg)	BW	26.8
Skin Surface area , adult (cm^2/day)	SA	4084
Adherence factor (mg/cm^2)	AF	0.50
Inhalation rate m3/day	IRA	10.8
Particulate emission factor (m^3/kg)	PEF	1.3E+09
Soil ingestion - occupational (mg/d)	IRS	200
Exposure frequency (d/yr)	EF	152
Exposure duration (yr)	ED	10
Averaging time - carcinogenic (yr)	AT_C	70
Averaging time - noncarcinogenic (yr)	AT_N	10

Chemical	Toxicity Factors				VOC?	Volatilization Factor (VF) (m^3/kg)	Sele Emis Fac (m^3
	Oral Slope Factor (kg-day/mg)	Inhalation Slope Factor (kg-day/mg)	Oral RfD (mg/kg-day)	Inhalation RfD (mg/kg-day)			
Dibenz(a,h)anthracene	7.30E+00				no		1.32
PCBs	2.00E+00	2.00E+00			no		1.32
Aroclor-1242	2.00E+00	2.00E+00			no		1.32
Aroclor-1248	2.00E+00	2.00E+00			no		1.32
Aroclor-1254	2.00E+00	2.00E+00	2.00E-05		no		1.32
Aroclor-1260	2.00E+00	2.00E+00			no		1.32
Benzo(a)pyrene	7.30E+00				no		1.32
Benzo(a)anthracene	7.30E-01				no		1.32
Benzo(b)fluoranthene	7.30E-01				no		1.32
Benzo(k)fluoranthene	7.30E-02				no		1.32
Indeno(1,2,3-cd)pyrene	7.30E-01				no		1.32